

DISCUSSION OF THE AMENDMENT

Multiple dependency has been eliminated. New Claims 9-14 have been added to claim subject matter deleted by the above-discussed elimination. In addition, the term “characterized in that” has been replaced with --wherein--.

No new matter is believed to have been added by the above amendment. Claims 1-14 are now pending in the application.

REMARKS

Applicants thank the Examiner for the courtesy extended to Applicants' attorney during the interview held December 13, 2007, in the above-identified application. During the interview, Applicants' attorney explained the presently-claimed invention and why it is patentable over the applied prior art, and discussed other issues raised in the Office Action. The discussion is summarized and expanded upon below.

Due to the length of the specification herein, Applicants will cite to the paragraph number of the published patent application (PG Pub) of the present application, i.e., US 2007/0093601, when discussing the application description, rather than to page and line of the specification as filed.

The rejection of Claims 1-5 under 35 U.S.C. § 103(a) as unpatentable over US 6,265,484 (Trepka et al) in view of US 4,049,595 (Dominguez), is respectfully traversed.

As recited in above-amended Claim 1, the present invention is a block copolymer composition which is a block copolymer composition comprising, as monomer units, from 55 to 95 mass% of a vinyl aromatic hydrocarbon and from 5 to 45 mass% of a conjugated diene, which composition contains the following components A and B in a blend ratio within a range of component A/component B = 20 to 80/80 to 20 (mass ratio): Component A is a block copolymer (1) which comprises, as monomer units, from 55 to 95 mass% of a vinyl aromatic hydrocarbon and from 5 to 45 mass% of a conjugated diene, (2) which is constituted by a hard segment block made mainly of the vinyl aromatic hydrocarbon and a soft segment block made mainly of the conjugated diene, (3) wherein the hard segment block comprises blocks S1 and S2 made mainly of a vinyl aromatic hydrocarbon having two types of different molecular weights, and when the number average molecular weights of S1 and S2 are represented by M1 and M2, respectively, **M1 is within a range of from 75,000 to 170,000 and M2 is within a range of from 14,000 to 30,000, and their ratio M1/M2 is within a**

range of from 4 to 9, and the ratio of S1 to S2 is within a range of **$S1/S2 = 6$ to $35/65$ to 94** (molar ratio), and (4) which is produced by a coupling reaction; and component B is a block copolymer (1) which comprises, as monomer units, from 55 to 95 mass% of a vinyl aromatic hydrocarbon and from 5 to 45 mass% of a conjugated diene, (2) which is constituted by a hard segment block made mainly of the vinyl aromatic hydrocarbon and a soft segment block made mainly of the conjugated diene, (3) wherein the hard segment block comprises blocks S3 and S4 made mainly of a vinyl aromatic hydrocarbon having two types of different molecular weights, and when the number average molecular weights of S3 and S4 are represented by M3 and M4, respectively, **M3 is within a range of from 80,000 to 160,000** and **M4 is within a range of from 4,000 to 12,000** and their ratio **M3/M4 is within a range of from 13 to 22**, and the ratio of S3 to S4 is within a range of **$S3/S4 = 5$ to $30/70$ to 95** (molar ratio), and (4) which is produced by a coupling reaction.

(Emphasis added.)

Thus, the present invention, as recited in Claim 1, is a composition comprising at least two vinyl aromatic hydrocarbon/conjugated diene copolymers, as components A and B, respectively, in a particular blend ratio, and wherein components A and B differ from each other at least with regard to the molecular weight profiles and relative amounts of the hard segment blocks present in each component.

The significance of the above-emphasized limitations of the claims is demonstrated by the comparative data in the specification, as Applicants' attorney pointed out during the above-referenced interview. Examples 1-18 are according to the present invention; Comparative Examples 1-16 are similar, except that one or more of the above-emphasized limitations is not satisfied. The data is tabulated in Tables 1-22, at paragraphs [0154]-[0175]. Particularly pertinent is the data obtained after second stage polymerization, which establishes the hard segment blocks. Compare the data in Tables 2 and 6 for examples of the

invention, and Tables 13 and 17 for the comparative examples, respectively. By reviewing the data in Tables 13 and 17 together, it can be seen that the following claim limitations herein are not satisfied: in Comparative Example 1, M3/M4; in Comparative Example 2, neither M2, M1/M2, M3, nor M4; in Comparative Example 3, M1; in Comparative Example 4, M3; in Comparative Example 5, neither M1, M2, M3, M4, nor M3/M4; in Comparative Example 6, M1/M2; in Comparative Example 7, neither S1/S2 nor S3/S4; in Comparative Example 8, similarly, neither S1/S2 nor S3/S4. The physical property data for these examples and comparative examples are shown in Table 10 for the examples and Table 21 for the comparative examples. By comparing the data, it is seen that the total absorption energy (J) and Charpy impact strength for the examples are vastly superior to the comparative examples.

Similar data appears in Table 11, which are examples according to the invention, and Table 22, which are comparative examples. In this embodiment, the block copolymer composition of the invention is blended with a general purpose polystyrene, as described in the specification at paragraph [0154]. The examples are vastly superior to the comparative examples with regard to total absorption energy, as shown in these tables.

The above-discussed results could not have been predicted by the applied prior art.

Trepka et al is drawn to tapered block copolymers of monovinylarenes and conjugated dienes (column 1, lines 19-21). Two embodiments are disclosed, each of which involves a multistep polymerization reaction. In the first embodiment, (a) a monovinyl aromatic monomer and an initiator is charged in the presence of a randomizer and polymerization is carried out until essentially no free monomer is present, (b) an initiator and a monovinyl aromatic monomer is charged and polymerization is carried out until essentially no free monomer is present, (c) a mixture of monovinyl aromatic monomer and conjugated diene monomer is charged and polymerization is carried out until essentially no free monomer is

present, and (d) the reaction mixture is charged with a coupling agent (column 2, lines 17-32). In the second embodiment, after step (c) and before step (d), a second separate charge of a mixture of a monovinyl aromatic monomer and a conjugated diene monomer is made and allowed to polymerize until essentially no free monomer is present before charging the reaction mixture with a coupling agent (column 2, lines 33-40).

At best, and as Applicants' attorney noted during the interview, the tapered block copolymers of Trepka et al are similar to presently-recited components A or B, but only individually and only generally, since Trepka et al disclose and suggest nothing with regard to any advantage of combining at least two such tapered block copolymers, let alone each one having the particular hard segment block molecular weight profile and relative amounts required by the present claims.

Trepka et al discloses neither specific hard segment block properties (such as M1, M2, M1/M2 and S1/S2 regarding component A, and M3, M4, M3/M4 and S3/S4 regarding component B) nor the use of component A and component B in combination, as recited in the present claims.

By the present application, the inventors discovered that by blending two kinds of block copolymers having a specific hard segment block portion structure, it is possible to remarkably improve impact resistance without degrading transparency, with regard to not only an extrusion-molded product and a blow-molded product but also an injection-molded product, as described at paragraph [0006].

Such properties cannot be obtained using a single component, such as disclosed in Trepka et al, and further, it is also impossible to obtain such properties even if two components shown in Trepka et al are simply used in combination.

Dominguez is drawn to block copolymer compositions comprising (a) a block copolymer having at least two monoalkenyl arene polymer blocks A and at least one

elastomeric conjugated diene block B, said blocks A comprising 8-65% by weight of the copolymer, (b) a high impact polystyrene resin containing from about 1-35 wt% elastomeric component, said resin having a molecular weight of over about 70,000, (c) a hydrocarbon rubber extending oil, and (d) a finely divided filler, for use in footwear applications (column 1, lines 44-60). The Examiner particularly relies on the disclosure of molecular weights of the monoalkenyl arene polymer blocks of component (a), as well as the weight percentage of these blocks in the finished block copolymer (column 2, lines 30-45).

But, as in Trepka et al, Dominguez also discloses neither specific hard segment block properties (such as M1, M2, M1/M2 and S1/S2 regarding component A, and M3, M4, M3/M4 and S3/S4 regarding component B) nor the use of component A and component B in combination, as recited in the present claims.

The Examiner holds that it would have been obvious “to utilize the process of making block copolymers in Trepka’s invention such that the high and low numbers average molecular weight of the polystyrene segments and the ratio of the high number average molecular weight of polystyrene block to the low number average molecular weight of polystyrene block are obtained in Trepka’s invention following by the teaching in Dominguez invention, and, thereby arrive at the claimed requirement.”

In reply, as noted during the interview by Applicants’ attorney, it is not clear why one skilled in the art would combine Trepka et al and Dominguez, but even if combined, the result would not be the presently-claimed invention. While the molecular weights of the blocks in Dominguez’s component (a), and the weight percentage of these blocks in the finished block polymer, are satisfactory for Dominguez’s purposes, why, absent the present disclosure as a guide, would one skilled in the art assume that they would be applicable for Trepka et al’s purposes? Nevertheless, neither reference discloses or suggests the above-discussed combination of block copolymers, or the superior results obtained thereby, as

discussed above. Indeed, the comparative examples herein are closer to the presently-claimed invention than any composition disclosed by the applied prior art. Compare *Ex parte Humber*, 217 USPQ 265 (Bd. Pat. App. & Inter. 1981) (**copy enclosed**) (comparative data showing the claimed chlorine-containing compounds to be unexpected over various (non-prior art) chlorine-containing isomers was accepted as more probative over prior art, drawn to non-chlorine containing analogs of the claimed compounds, asserted to be closest.)

For all the above reasons, it is respectfully requested that this rejection be withdrawn.

The rejection of Claims 1-5 under 35 U.S.C. § 103(a) as unpatentable over JP 07-173232 (JP '232) in view of Dominguez, is respectfully traversed. The relevant disclosure in JP '232 (which the Examiner notes is in the same patent family as EP 0646607 and which EP document is in the English language) is substantially similar to that in Trepka et al, discussed above. Thus, for essentially the same reasons as discussed above with regard to the rejection over Trepka et al in view of Dominguez, the present rejection is incorrect as well.

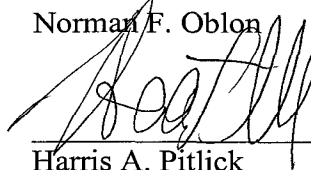
Accordingly, it is respectfully requested that this rejection be withdrawn.

The objection to Claims 6-8 as being in improper multiply dependent form is now moot in view of the above-discussed amendment. Accordingly, it is respectfully requested that the objection be withdrawn.

All of the presently-pending claims in this application are now believed to be in immediate condition for allowance. Accordingly, the Examiner is respectfully requested to pass this application to issue.

Respectfully submitted,

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